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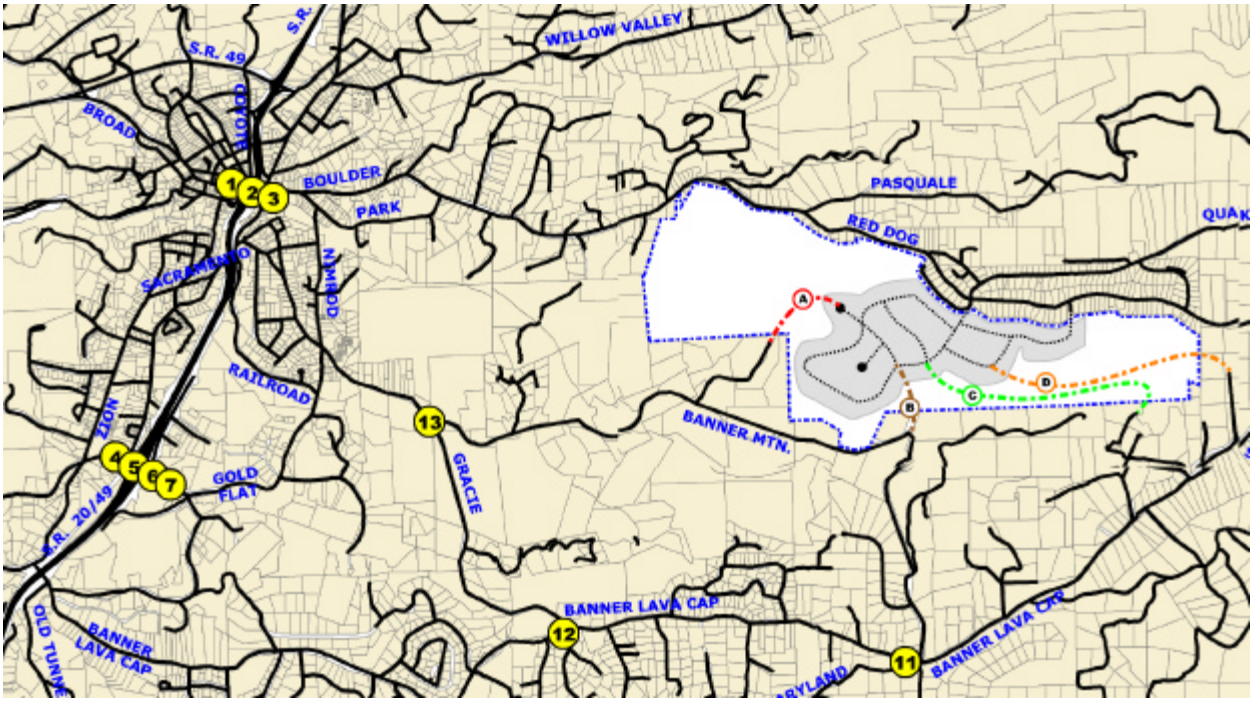

BOULDER STREET ALTERNATIVES STUDY II
DRAFT REPORT

Prepared for
THE NEVADA COUNTY TRANSPORTATION COMMISSION

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Methodology

The NCTC, Nevada County, and PRISM Engineering met with Nevada City Staff to determine the current thinking on potential solutions that have been discussed for this area. The City made it clear that alternative access for Deer Creek II was desired, in order to avoid further impacting Boulder Street. True to that charge, this study examined the potential connection of four different alternative access roads on the south side of the Deer Creek II property sending traffic to Banner Mountain Trail and Banner Lava Cap Road in the immediate vicinity.

The Deer Creek Park residential development area is located in a geographical area that would typically have access direct to Red Dog Road which leads to the City of Nevada City. It was discussed that if future Deer Creek II residents desired to go to areas south of Nevada City it would be useful to provide access towards say, Idaho Maryland Road (via Banner Mountain Trail or Banner Lava Cap Road, etc. This idea might help provide circulation opportunities to help avoid further impacting the Nevada City downtown intersections.

This study looked at the impact of these various alternatives for traffic circulation in terms of level of service, neighborhood impacts, feasibility of construction given terrain and existing homes, etc.

This study examines LOS at intersections, and LOS along key street segments including Idaho Maryland Road, Red Dog Road/Boulder Street, Gold Flat Road, etc. We also considered the travel times along various alternatives to reach the surrounding street system or freeway system.

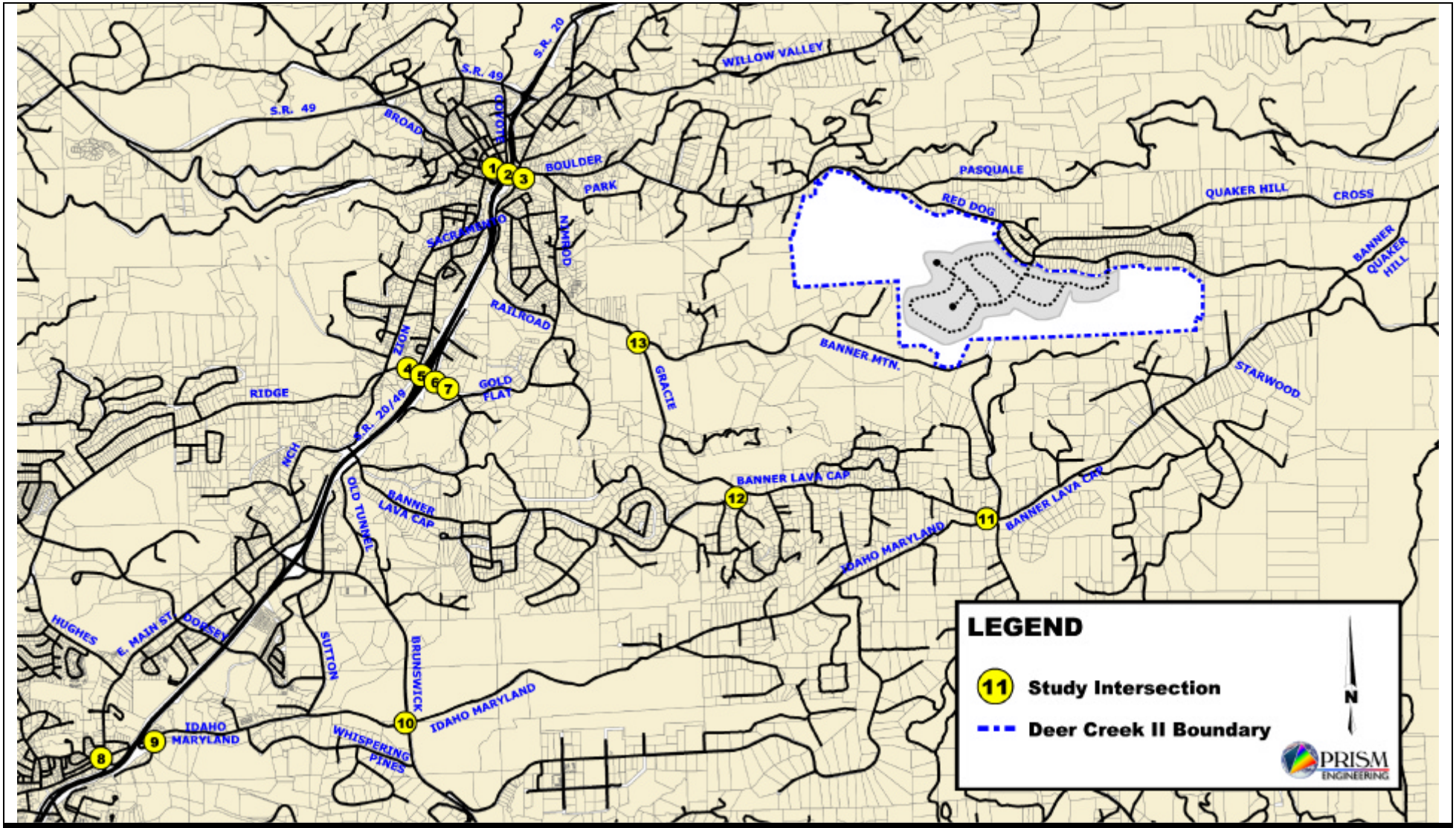

Figure 1 Study Intersections ***(corresponds with Tables 1 & 2)***

ANALYSIS OF EXISTING AND CUMULATIVE CONDITIONS

Figure 1 shows the location of the 13 study intersections analyzed in this report. These intersections are identified in the following sub-groups:

- Nevada City Downtown Intersections:
  - SR 20/49 WB Ramp at Boulder Street
  - SR 20/49 EB Ramp at Boulder Street
  - Sacramento Street at Boulder Street
- Gold Flat Interchange Intersections:
  - Searls Ave. at Ridge Road
  - SR 20/49 WB Ramps at Gold Flat Road
  - SR 20/49 EB Ramps at Gold Flat Road
  - Hollow Way at Gold Flat Road
- Idaho Maryland Road Intersections:
  - East Main Street at Idaho Maryland Road
  - SR 20/49 EB Ramp at Idaho Maryland Road
  - Brunswick Road at Idaho Maryland Road
  - Banner Lava Cap Road at Idaho Maryland Road
- Gracie Road Intersections:
  - Gracie Road at Banner Lava Cap Road
  - Gracie Road at Banner Mountain Road

All data was entered into HCM 2000 analysis software to determine the level of service for each intersection approach, as well as the overall intersection level of service. Table 1 reports the existing Year 2004 level of service for each of the study intersections and their respective intersection approaches. Table 2 reports the 20 year Cumulative Conditions future scenario.

The Nevada City downtown intersections are operating at LOS D or better conditions, as the Boulder Street / Sacramento Street intersection governs operations of the set of three intersections crossing the SR 20/49 freeway (Broad/Boulder Street). The Gold Flat interchange intersections are operating unacceptably, with LOS F conditions for the SR 20/49 NB Off-ramp at this location, as well as the EB approach of Ridge Road at Searls. Long lines of vehicles form during the pm peak hour time period at each of these three approaches. The Idaho Maryland Road SR 20/49 freeway ramp intersections are at LOS F conditions for the SR 20/49 EB offramp, the WB Idaho Maryland approach at East Main Street, and the SB East Main Street approach at Idaho Maryland Road.

Table 1, Intersection Levels of Service, Existing 2004 Conditions

Int #	North/South Street	East/West Street	EB L	EB T	EB R	WB L	WB T	WB R	NB L	NB T	NB R	SB L	SB T	SB R	TOTAL	Avergage LOS
1	SR 20/49 WB Ramp	at Broad Street	54	89	120	128	203	209	0	0	0	68	124	57	**1052**	**C**
				C			*C*						*C*			
2	SR 20/49 EB Ramp	at Broad Street		166			449		102		165				**882**	**A**
				A			*A*		*C*							
3	Sacramento Street	at Boulder Street	48	196	83	28	221	14	149	92	93	22	41	80	**1067**	**D**
				D			*C*			*E*			*C*			
4	Searls Ave.	at Ridge Road	20	490	10	10	400	221	0	0	30	221	0	20	**1422**	**D**
				F			*A*			*B*			*C*			
5	SR 20/49 WB Ramps	at Gold Flat Road	0	315	426	148	426	0	0	0	0	40	0	205	**1560**	**C**
				A			*A*						*F*			
6	SR 20/49 EB Ramps	at Gold Flat Road	197	161	0	0	199	44	374	0	94	0	0	0	**1069**	**F**
				E			*C*			*F*						
7	Hollow Way	at Gold Flat Road	87	161	13	0	161	13	4	0	0	7	0	78	**524**	**A**
				A			*A*			*C*			*B*			
8	East Main Street	at Idaho Maryland Road	286	124	12	362	247	128	44	41	50	45	304	408	**2051**	**E/F**
				D			*F*			*B*			*F*			
9	SR 20/49 EB Ramp	at Idaho Maryland Road		217	165	50	621		300		315				**1668**	**F**
				A			*A*			*F*						
10	Brunswick Road	at Idaho Maryland Road	14	35	177	12	45	34	203	518	33	41	459	8	**1579**	**D**
				F			*F*			*B*			*A*			
11	Banner Lava Cap Road	at Idaho Maryland Road	14	59			25	28				47		11	**184**	**A**
				A			*A*					*A*				
12	Gracie Road	at Banner Lava Cap Road	4	80			40	20				36		2	**182**	**A**
				A			*A*					*A*				
13	Gracie Road	at Banner Mountain Road				0		19		39	1	29	49		**137**	**A**
						A				*A*			*A*			

Source: PRISM Engineering HCM Analysis
(see Figure 1 for location of intersections on map)
Note: levels of service shown are for an unmitigated condition.

Table 2, Intersection Levels of Service, Cumulative Conditions

Int #	North/South Street		East/West Street	EB L	EB T	EB R	WB L	WB T	WB R	NB L	NB T	NB R	SB L	SB T	SB R	TOTAL	Avergage LOS
1	SR 20/49 WB Ramp	at	Broad Street	75	145	170	180	285	290	0	0	0	85	125	55	**1410**	**F**
					E			*F*						*C*			
2	SR 20/49 EB Ramp	at	Broad Street		230			515		240		230				**1215**	**F**
					A			*A*		*F*							
3	Sacramento Street	at	Boulder Street	65	290	115	75	245	20	210	130	260	30	55	60	**1555**	**F**
					F			*F*			*F*			*C*			
4	Searls Ave.	at	Ridge Road	27	662	14	14	540	298	0	0	41	298	0	27	**1921**	**F**
					F			*F*			*B*			*E*			
5	SR 20/49 WB Ramps	at	Gold Flat Road	0	425	575	200	575	0	0	0	0	54	0	277	**2106**	**E/F**
					C			*C*						*F*			
6	SR 20/49 EB Ramps	at	Gold Flat Road	266	217	0	0	269	59	505	0	127	0	0	0	**1443**	**F**
					F			*E*			*F*						
7	Hollow Way	at	Gold Flat Road	117	217	18	0	217	18	5	0	0	9	0	105	**706**	**A**
					A			*A*			*D*			*B*			
8	East Main Street	at	Idaho Maryland Road	386	167	16	489	333	173	59	55	68	61	410	551	**2768**	**F**
					F			*F*			*C*			*F*			
9	SR 20/49 EB Ramp	at	Idaho Maryland Road		293	223	68	838	0	405	0	425				**2252**	**F**
					E			*C*			*F*						
10	Brunswick Road	at	Idaho Maryland Road	19	47	239	16	61	46	274	699	45	55	620	11	**2132**	**F**
					F			*F*			*B*			*A*			
11	Banner Lava Cap Road	at	Idaho Maryland Road	20	160			80	40				65		15	**380**	**A**
					A			*A*					*A*				
12	Gracie Road	at	Banner Lava Cap Road	5	108			54	27				49		3	**246**	**A**
					A			*A*					*B*				
13	Gracie Road	at	Banner Mountain Road				5		20		140	5	30	170		**370**	**A**
							A				*A*			*A*			

Source: PRISM Engineering HCM Analysis
(see Figure 1 for location of intersections on map)
Note: levels of service shown are for an unmitigated condition.

Comparing the results shown in Table 1, it can be seen that the Broad Street / Boulder Street intersections (operating at LOS D or better) have a more favorable level of service than exists at the Gold Flat interchange group of intersections, or the Idaho Maryland interchange groups of intersections where LOS F conditions prevail during the pm peak hour time period. When LOS F traffic congestion is present, the number of minutes that drivers are delayed in their vehicles varies with traffic volume, which can change slightly from day to day. In general, the values shown in Table 3 show how level of service correlates with the delay of motorists.

Table 3
Delay Level of Service Criteria

LOS	Unsignalized	Signalized
A	1-10 seconds	1-10 seconds
B	11-15 seconds	11-20 seconds
C	16-25 seconds	21-35 seconds
D	26-35 seconds	36-55 seconds
E	36-50 seconds	56-80 seconds
F	51+ seconds	81+ seconds

Source: PRISM Engineering, Synchro Pro, and HCM 2000

Since all intersections in this study are *unsignalized* for the existing condition, the second column in Table 3 applies, meaning, that if drivers are delayed for 51 seconds or more at any one intersection, this equates to LOS F conditions. It can be expected that once LOS F conditions are reached, that the minimum delay to a motorist will be about approximately one minute, with higher delays as the volume increases.

The results shown in Table 1 and 2 are for an unmitigated condition so as to make logical the comparison of any LOS changes corresponding with increases in traffic volume. It can be seen from Table 2 that the Nevada City Boulder Street intersections in the vicinity of the freeway are projected to fail with LOS F conditions for all three intersections.

Travel Time Comparisons

Travel times to and from the Deer Creek II project site and other areas in the region are compared in this section. Two “destinations” from the Deer Creek II site were arbitrarily selected, including the Brunswick Basin

interchange vicinity, and the Grass Valley vicinity southwest of Idaho Maryland Road.

Figure 2 has been prepared to show the “free-flow” uncongested travel times for a driver observing the speed limits, making stops at stop signs, and an occasional minor wait for traffic at various intersections along the way. The surveys were taken during non-peak hour times to get an idea of an “ideal” travel time for comparison purposes. When the delays of a minute or more are taken into account at intersections where LOS F conditions now exist (see Table 1), then the travel times may go up dramatically.

The logical conclusion from viewing Figure 2 and Table 1 is that the best travel times to and from the Deer Creek II project site are possible via Red Dog Road and Boulder Street.

Grass Valley Downtown Vicinity

In a vehicle trip to or from the Golden Center Freeway southwest of Idaho Maryland Road it took 10 minutes to travel along the Red Dog / Boulder Street path. In comparison, it took 12-14 minutes to travel along the Idaho Maryland Road route to the same location. This is a two to four minute increase in travel time, depending on congestion conditions.

Brunswick Basin Interchange Vicinity

Comparing the travel time of a vehicle trip to and from the Brunswick Basin Interchange area is even more dramatic. It took only 8 minutes when traveling along the Red Dog path to get to the Brunswick interchange. In comparison, it took 12-14 minutes to travel along the Banner Lava Cap route to Nevada City Highway to Brunswick Road. This is a four to six minute differential in comparison.

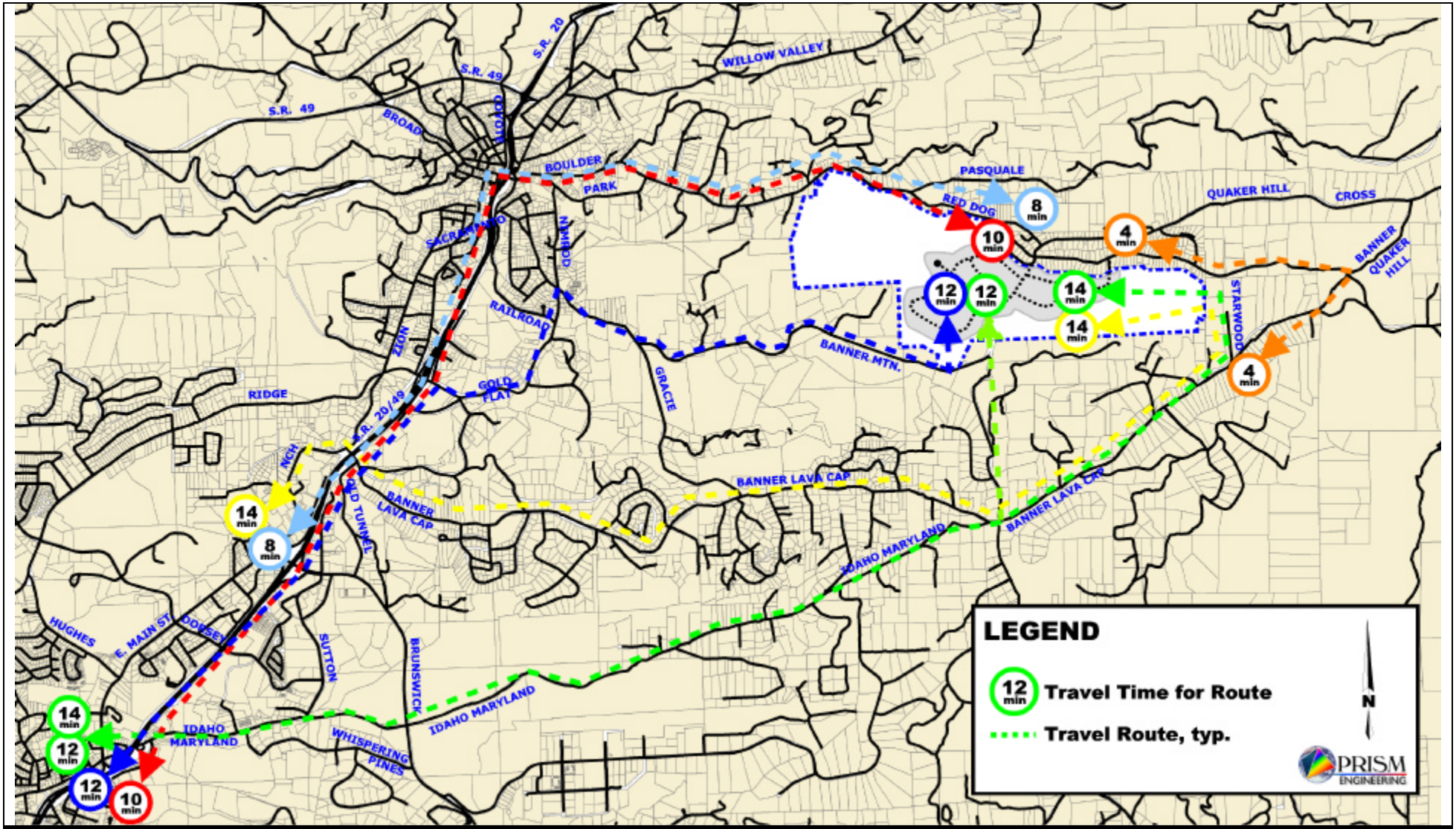

Figure 2 Measured Travel Times on Various Streets to and from Deer Creek II Project Vicinity

These travel time comparisons can be interpreted to mean that if a Deer Creek II resident had the choice to use the Red Dog Road path vs. the Banner Lava Cap Road or Idaho Maryland Road or Gold Flat Road path, that the preferred choice would be a shorter time trip along Red Dog Road: two to four minutes shorter (plus little congestion during peak hours). The Red Dog Road path is more "attractive" given a travel choice. If access to Deer Creek II is provided to both Red Dog Road and Banner Lava Cap Road, local residents could choose a travel path. If the City of Nevada City desires to discourage travel to Red Dog Road from Deer Creek II residents, various "traffic calming" devices could be installed along Red Dog Road to increase travel times along Red Dog Road. Traffic calming is a traffic engineering technique to discourage traffic from using a road, and to slow speeds of vehicles using the road. These anti-capacity devices could include speed bumps within the City Limits along Boulder Street, lowered speed limits, etc., resulting in increased travel time. A side effect of installation of traffic calming devices is the impact to vehicle wear-and-tear for drivers who must use the road and have no alternative.

Deer Creek II Conceptual Access Alternatives

Figure 3 shows four different access concepts to provide access to Deer Creek II from the south side. If no driver choice is given to Deer Creek II future residents, and access to the project is taken from one or more of these concept routes on the south side, then the impact to Red Dog Road will likely be reduced, however, sending traffic to Banner Lava Cap Road is not necessarily desirable, as these alternative routes are congested during the peak hour more than the Nevada City intersections.

It should be noted that the travel times (shown in Figure 2) for an access alignment to Starwood (alternative D) is 14 minutes via Banner Lava Cap Road either to the Nevada City Highway/Brunswick intersection or to the Idaho Maryland Road interchange area (this is the time for uncongested "free-flow" speed during non peak hour). It should further be noted that the comparable travel time from an Alternative D access using Banner Lava Cap to Red Dog Road and down the SR 20/49 freeway would also be a total of 14 minutes (2 minutes out along Starwood, 4 minutes to Red Dog Road, and then 8 minutes along Red Dog Road to SR 20/49). During the pm peak hour time period, the Red Dog route will actually be up to a minute longer, but the Idaho Maryland Road path will be several minutes longer than 14 minutes where delays at Brunswick and East Main Street can exceed several minutes. Even if Deer Creek II vehicles are forced to use say, Alternative D

to access Starwood to Banner Lava Cap Road, drivers will likely travel north along Banner Lava Cap and “back-track” to Red Dog Road, to save time, and more especially so during the pm peak hour time period when congestion at the Idaho Maryland intersections is higher than other times of the day.

When comparing the Deer Creek II trip to and from the Brunswick/Nevada City Highway intersection, these are both approximately 14 minutes plus any additional delay for peak hour congestion in the vicinity.

Figure 4 shows the level of service along conceptual travel paths with various colored lines defined in the legend. Blue lines show where LOS A uncongested conditions exist during the pm peak hour time period. Orange/red lines suggest where LOS E or LOS F conditions generally exist, and where drivers would be consistently delayed more than a minute during the pm peak hour time period. Paths to and from the proposed Deer Creek II project area that have orange or red lines will be less desirable, than the yellow lines that are depicted for the Nevada City street system near the Boulder / Sacramento Street intersection.

Also shown on the figure is the average level of service for each of the study intersections at the intersection only. For example, the intersection of Idaho Maryland at Brunswick Road is at LOS D on the average, but the Brunswick Road approaches operate at LOS B, and the Idaho Maryland approaches operate at LOS F (see Table 1).

Since LOS A conditions exist on all streets to the east of the SR 20/49 freeway, delay on the rural mountainous roadways is not a factor in comparing travel path choice. However, delay becomes a factor in the vicinity of the SR 20/49 freeway intersections for these same roads. Figure 4 shows blue lines changing to yellow (LOS D) and orange (LOS E) as they approach the freeway vicinity.

In summary, the conceptual travel paths to and from the propose Deer Creek II project site on the south side (Alternatives A, B, C, and D) will have more delay due to peak hour congestion than will the Red Dog Road travel paths. This makes the Red Dog Road travel path more attractive and desirable from a travel time and delay-avoidance standpoint.

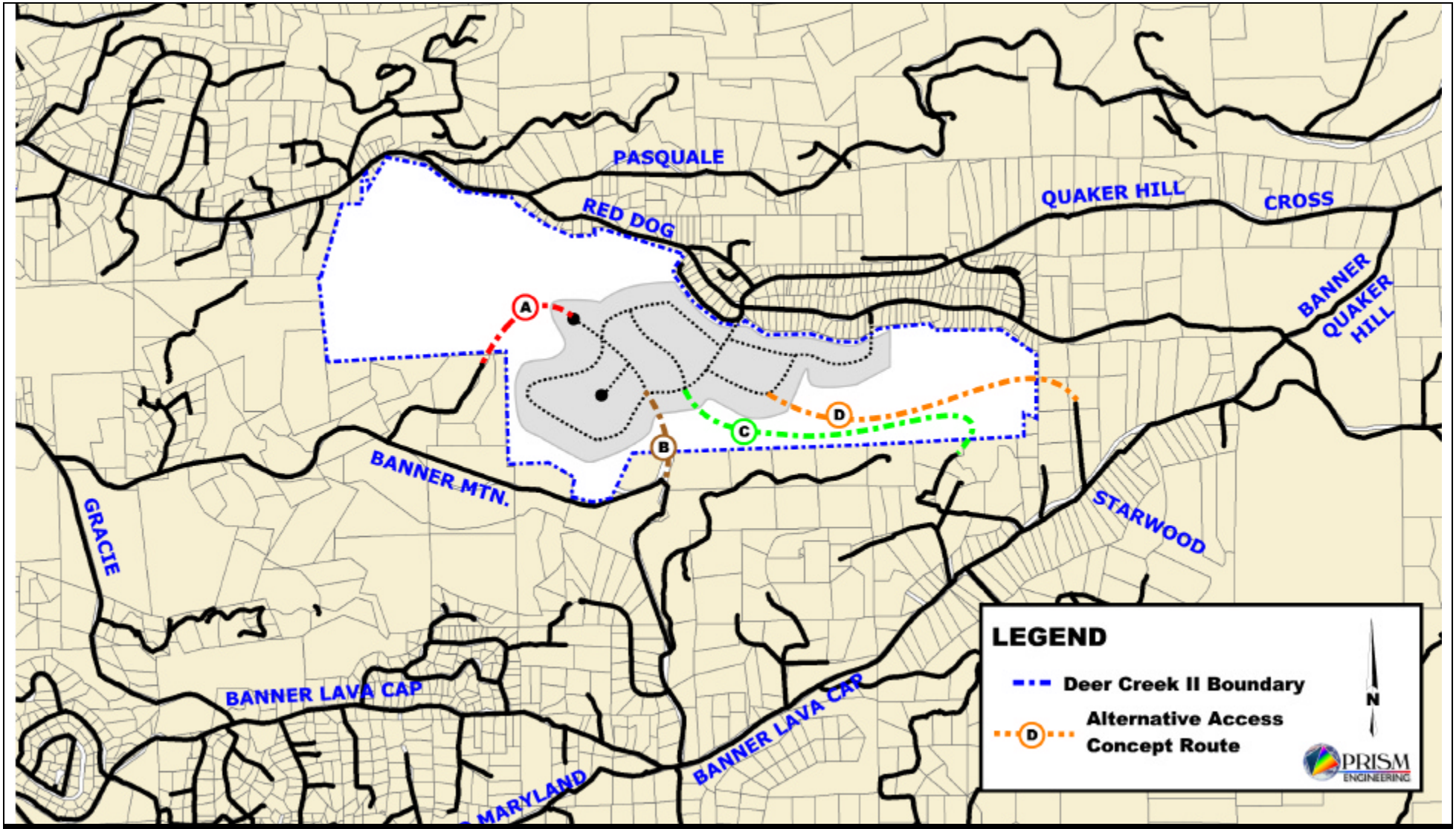

Figure 3 Potential Alternative Access Concept Routes to Deer Creek II Project Site

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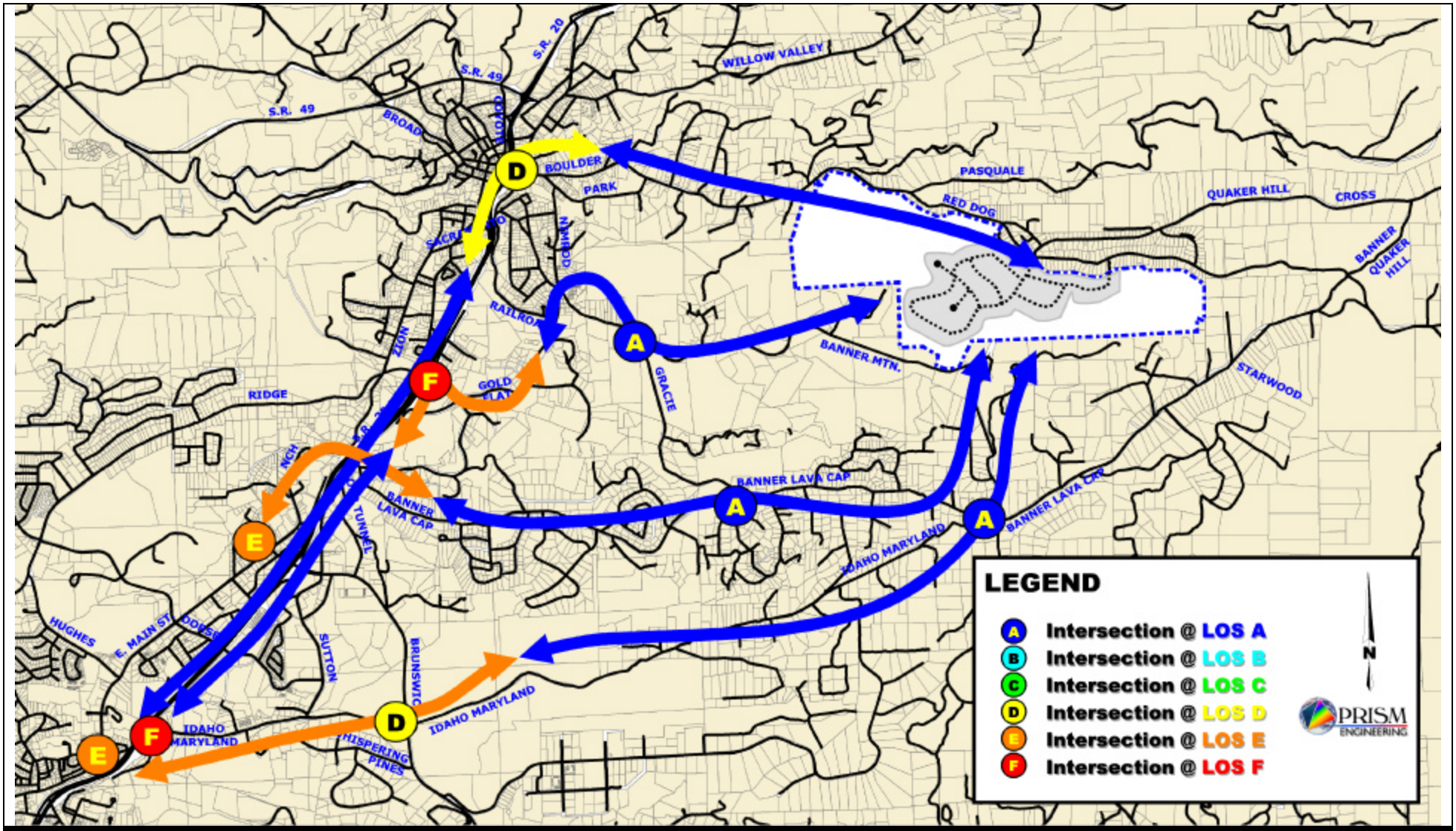

Figure 4 Driver Choices of Route by Level of Service

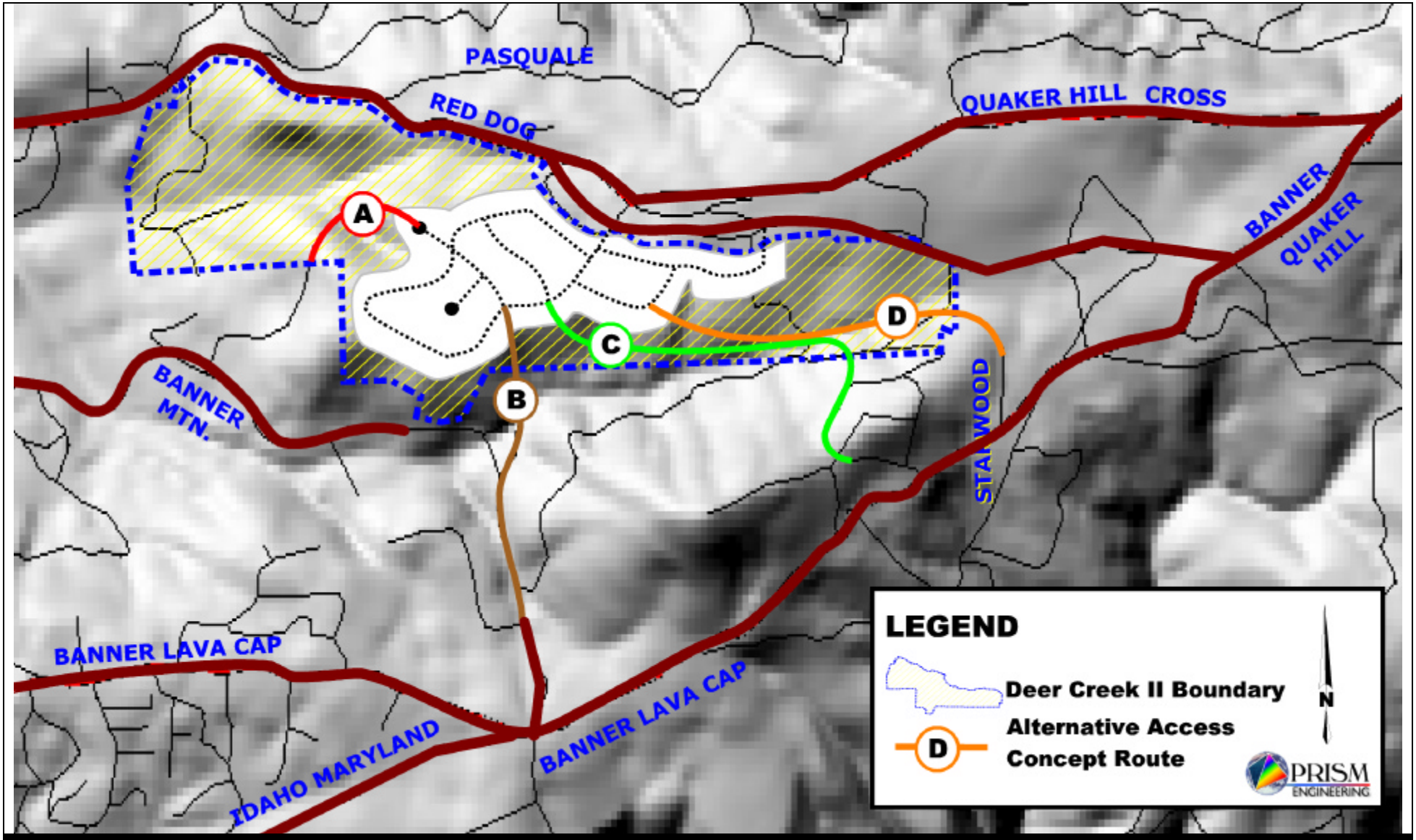

Figure 5 Topography Considerations in Developing Alternative Routes

Topography and Access Issues for Each Alternative

Topography constraints for each access alternative will likely be a factor in the viability of each alternative alignment (Concepts A, B, C, and D shown on Figure 3 and Figure 5). Figure 5 shows the locations of these alignments on a topography relief map that illustrates mountainous areas with light and dark shadowing. The dark areas shown on Figure 5 represent shadowing from sunlight, and where the terrain is steep and difficult to construct a road. It is in these light and dark areas where the terrain is the steepest and where constructing roads and bridges will be more challenging or cost prohibitive. In addition to the high cost, any new road connections would create an impact to homes and property that already exist in the area between the project site and Banner Lava Cap Road. Alternatives B and C would traverse especially steep terrain, and cause significant environmental impact to the surrounding terrain from cut and fill to create a 24 foot wide road. Alternative B would travel along the north/south section of Banner Mountain Trail, which is a single lane dirt road on a very steep hillside, with a creek below. Expansion of this road, for example, seems prohibitive.

Alternative A is an alignment concept that would ultimately connect Deer Creek II to the east/west section of Banner Mountain Trail at it's midpoint east of Gracie Road. It would allow for most of the Deer Creek II traffic to travel towards the congested Gold Flat interchange area via Banner Mountain Trail and Gracie Road. Other than the impact to local streets, this alternative would not be cost-prohibitive to construct, and would be similar to costs of other road construction on the project site itself. The impact to local homes and neighborhoods is expected to be significant.

Alternative B is an alignment concept that connects into the north end of the north/south section of Banner Mountain Trail between the project site and Banner Lava Cap Road. This connection would first descend steep terrain down to a needed bridge to cross over Little Deer Creek at the north end of Banner Mountain Trail. The single lane Banner Mountain Trail dirt road in this area would need to be widened and paved to a 24 foot section for a distance of nearly one mile from the north end to Banner Lava Cap Road. The northerly portions of this road are traveling along the upper side of Little Deer Creek. The mid to southerly section travels immediately adjacent to the NID irrigation ditch. The only way that this road could be widened given these constraints is through extensive retaining walls on both sides of the road to support slopes that are too steep to naturally maintain their position. The environmental impact of such a change would be very significant. The

cost of widening and paving this road would be extremely high given the steep terrain, and the need to retaining walls. The estimated construction costs would be in the several millions of dollars.

The Alternative C alignment concept would traverse steep terrain on both sides of Little Deer Creek, and cross the creek with a bridge. The alignment then heads to Banner Mountain Lookout Road, a “private road for residents only” according to a sign at the Banner Lava Cap Road intersection. Banner Mountain Lookout is at an elevation of 3900 feet. Little Deer Creek below is at 3250 feet below. Although this alignment would not travel to the top of the Banner Mountain Lookout, the terrain in the area is challenging to construct a new road. Along Banner Mountain Lookout Road are homes and properties that are already built up. The elevation of the “flat” area east of Banner Mountain Lookout is 3680 feet where a new road would connect into Banner Mountain Lookout Road approximately 2/10 of a mile north of Banner Lava Cap Road. Figure 6 shows a photo of this road to illustrate that it is already built up, and is surrounded by tall trees are forested area. It is estimated that hundreds of large cedar trees would need to be cut down to make way for this alignment.

Alignment D is similar to Alignment C in that it extends access to the east. However, the further east the access goes, the more likely it is that traffic will travel along Red Dog Road and SR 20/49 via Nevada City, rather than travel via Banner Lava Cap Road to and from areas west of the project site. Alignment D conceptually ties into Starwood Way, a 12 foot to 18 foot wide dirt road. At the north end of Starwood Way are two large homes and landscaped properties, making the connection of Alignment D a significant impact, if possible at all without inverse condemnation. Given the high value of the homes in the area, this would be an expensive option. The terrain of this connection is moderate, however, and road construction would be similar to that in Deer Creek II.

Banner Mountain Lookout Road 2/10 mile north of Banner Lava Cap Road. Heavily forested area. Surrounding homes and property. Steep terrain straight ahead downward to Deer Creek.

Starwood is a dirt road running north/south from Banner Lava Cap Road approximately 1/3 mile until it dead ends with two large homes and property at its north end.

Boulder Street looking north to Park. Stop sign control at all approaches. Boulder Street intersections Red Dog Road about ½ mile east of Park. It is the main road feeding into Nevada City.

Looking east across SR 20/49 freeway bridge towards Boulder/Sacramento Street intersection. This set of intersections operates at LOS D conditions during pm peak hour.

Figure 6 Study Area, Various Photos

Conclusions

The Deer Creek II project will have a significant traffic impact to existing neighborhoods that cannot be avoided. However, certain mitigation measures are possible, some at prohibitive costs, to help alleviate impacts. Three mitigation concepts are listed below, each being mutually exclusive of each other.

1. Installation of traffic calming devices on Boulder Street to discourage "through" traffic. These include speed bumps, chokers, raised cross-walks, street closures, etc. to discourage and hinder "through" traffic.
2. Installation of alternative access for the Deer Creek II project to send traffic to Banner Mountain Trail or Banner Lava Cap Road. These are for the most part, cost-prohibitive in that they travel through heavily forested areas on very steep terrain, and through homes and properties that are already built up.
3. Installation of a traffic signal at Boulder Street and Sacramento Street to alleviate congestion and facilitate the orderly movement of traffic. This solution is the easiest and most cost-effective, but is not desired by the City of Nevada City.

Each of these three mitigations are not necessarily desirable for Nevada City or Nevada County or Grass Valley, as they have negative side-effects.

The first mitigation will slow traffic on Boulder Street, increase polluting vehicle emissions, and possibly get some motorists to use Banner Lava Cap Road as an alternative if they live in the northern regions of Red Dog Road.

The second mitigation will reduce any traffic impact of Deer Creek II to Boulder Street, but at a cost to impacting other local residents in the County. It seemed apparent from our field surveys that construction of Alternatives B, C or D would create adverse impacts to local properties, likely resulting in the need to purchase and remove some homes.. In addition, the terrain is steepest and most difficult for Alternative B, even bordering on infeasible. Alternatives C and D impact some homes and properties, or in other words, there is no logical path to connect to Banner Mountain Lookout Road or Starwood without cross existing properties that are already built up. Alternative A sends traffic to the Gold Flat interchange which has been identified as unacceptable to the City of Nevada City, as this area is significantly more congested than the Boulder Street corridor.

The third mitigation, to signalize and use traffic engineering technology to increase capacity and reduce delays to motorists has been identified as a solution unacceptable to the City of Nevada City, and is only mentioned in this report as an alternative that was considered. If signals were to be installed, traffic volumes would not increase, but congestion would disappear and the SR 20/49 freeway ramp intersections would operate at LOS A conditions with little to no delays.

Given the City's policy to not consider traffic signals to mitigate traffic impacts, there is only one other option for the City to increase capacity to handle future growth as per the General Plan: Build new roads. Building new roads in the vicinity of Deer Creek II is very difficult given that the area is significantly built up around it. It is also in the County over which the City has no control. Building new roads in the City of Nevada City is even more difficult, if not infeasible.

Red Dog Road to Boulder Street is a corridor that has long been identified as one that would serve the transportation needs for development of the County's General Plan into the future. Using conventional traffic engineering mitigation methods, it is possible to keep Red Dog Road and Boulder Street operating at acceptable levels of service into the future. The construction of new roads to take traffic along this corridor to other corridors is not an acceptable solution to neighboring communities such as the City of Grass Valley. In fact, the levels of service for Idaho Maryland Road and the Brunswick Basin far exceed the congestion anywhere in Nevada City both now and for Cumulative Conditions in the future. The alternative access concept routes A, B, C, and D identified in this report would send the Deer Creek II traffic to areas that are more congested than Nevada City, and this does not seem to be an acceptable solution given the needs of the County and the City of Grass Valley. It makes the most sense to provide access of Deer Creek II to Red Dog Road as planned, with the possibility of a secondary access along the Alternative A alignment, if acceptable to the City of Nevada City. The concerns of Nevada City over the Gold Flat interchange congestion can be mitigated with modern roundabouts or signal installations, bringing an LOS F condition to LOS B/C conditions for the Cumulative Conditions future scenario.

Recommendations

The Deer Creek II project should have access to Red Dog Road as its primary access. The alternative alignments A-D only further aggravate

remote areas that are significantly more congested than Boulder Street in Nevada City, both now in 2004 and in the Cumulative future year scenario. Even though the Nevada City intersections along Boulder Street in the vicinity of the freeway go to LOS F also, the predicted delays at other intersections are higher, unless mitigated. However, no planned mitigations are in place for Idaho Maryland Road at Brunswick Road, or for the Gold Flat interchange area.

It is recommended that Nevada City:

1. Adopt a level of service exception for certain roads such as Boulder Street, to make acceptable an LOS E of LOS F condition.
2. Investigate traffic calming solutions along Boulder Street to reduce "through" traffic, reduce speeds, and enhance quality of life for local residents.

Or as an alternative,

3. Reconsider its policy against traffic signal installations to enable better levels of service for future traffic.